Alg. 2 Warm Up #11-2

Find the roots of each polynomial:

1. $y = x^2 - 6x + 8$
2. $y = x^2 - 6x + 9$
3. $y = x^3 - 4x$
4. $y = x^2 - 7$

HW Questions:

Review & Preview

8-8. For each equation below, make tables that include x-values from -2 to 2 and draw each graph.

$y = x^3$

a. $y = (x-1)^2(x+1)$

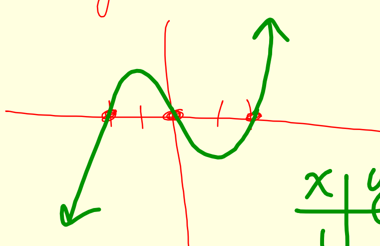
b. $y = (x-1)^2(x+1)^2$ $y = x^4$

c. $y = x^3 - 4x$

d. What are the parent functions for these equations?

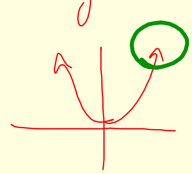
$y = x(x^2 - 4)$

$y = x(x+2)(x-2)$

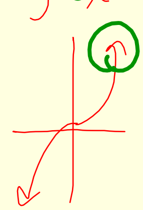


x	y
-1	
1	

$y = x^2$



$y = x^3$



8-9. **Polynomials** are expressions that can be written as a sum of terms of the form:

$$(\text{any number}) \cdot x^{(\text{whole number})}$$

Which of the following equations are polynomial equations? For those that are not polynomials, explain why not. Check the lesson 8.1.1 Math Notes box for further details about polynomials.

a. $f(x) = 8x^5 + x^2 + 6.5x^4 + 6$

b. $y = \frac{3}{5}x^6 + 19x^2$

c. $y = 2^x + 8$

d. $f(x) = 9 + \sqrt{x} - 3$

e. $P(x) = 7(x-3)(x+5)^2$

f. $y = x^2 + \frac{1}{x^2+5}$

g. Write an equation for a new polynomial function and then write an equation for a new function that is not a polynomial.

8-11. Solve the following system: $y = x^2 - 5$
$y = x + 1$

8-12. A table can be used as a useful tool for finding some inverse functions. When the function has only one x in it, the function can be described with a sequence of operations, each applied to the previous result. Consider the following table for $f(x)=2\sqrt{x-1}+3$.

	1^{st}	2^{nd}	3^{rd}	4^{th}
What f does to x:	subtracts 1	$\sqrt{\ }$	multiplies by 2	adds 3

Since the inverse must undo these operations, in the opposite order, the table for $f^{-1}(x)$ would look like the one below.

	1^{st}	2^{nd}	3^{rd}	4^{th}
What does f^{-1} to x:	subtracts 3	divides by 2	$(\ )^2$	adds 1

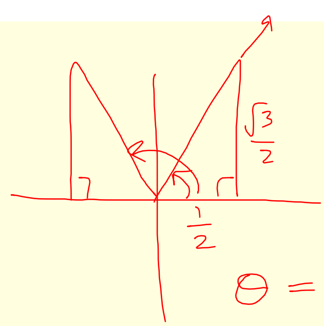
a. Copy and complete the following table for $g^{-1}(x)$ if $g(x)=\frac{1}{3}(x+1)^2-2$

	1^{st}	2^{nd}	3^{rd}	4^{th}
What g does to x:	adds 1	$(\ )^2$	divides by 3	subtracts 2
What g^{-1} does to x:			$\sqrt{\ }$	

b. Write the equations for $f^{-1}(x)$ and $g^{-1}(x)$.

8-16. Without a calculator, find two solutions $0^\circ \le \theta < 360^\circ$ that make each of the following equations true.

a. $\cos\theta=\frac{1}{2}$ b. $\tan\theta=-1$ c. $\sin\theta=\frac{\sqrt{3}}{2}$ d. $\cos\theta=-\frac{\sqrt{3}}{2}$



$\theta = 60^\circ, 120^\circ$

8-17. Which of the following equations are polynomial functions? For each one that is not, justify why not.

a. $y = 3x^2 + 2x^2 + x$

b. $y = (x-1)^2(x-2)^2$

c. $y = x^2 + 2^x$

d. $y = 3x - 1$

e. $y = (x-2)^2 - 1$

f. $\sqrt{y^2} = \sqrt{(x-2)^2 - 1}$

g. $y = \frac{1}{x^2} + \frac{1}{x} + \frac{1}{2} \rightarrow x^{-2}$

h. $y = \frac{1}{2}x + \frac{1}{3}$

i. $y = x$

j. $y = -7x^0$

0, 1, 2, 3, 4

$y = (\mathbb{R})x^{(\text{whole number})}$

8-18. Samantha thinks that the equation $(x-4)^2 + (y-3)^2 = 25$ is equivalent to the equation $(x-4)+(y-3)=5$. Is she correct? Are the two equations equivalent? Explain how you know. If they are not equivalent, explain Samantha's mistake.

$x - 4 + y - 3 = 5$

$x + y = 12$

8-19. Find the **roots** (the solutions when $y = 0$) of each of the following polynomial functions.

a. $y = x^2 - 6x + 8$

b. $f(x) = x^2 - 6x + 9$

c. $y = x^3 - 4x$

Yesterday's CP's

8-4. Continuing your work as a team, examine the equation $P_2(x) = 2(x-2)(x+2)(x-3)$.

$2(-2)(2)(-3)$

3rd degree

a. How many distinct (different) factors are there? How many x-intercepts would you predict it would have on its graph? Draw the graph and label the x-intercepts. How is this graph similar to or different from the graph of $P_1(x)$? $= (x-2)(x+5)^2$ 3rd deg

b. Does the factor 2 have any effect on the x-intercepts? On the shape of the graph? On the y-intercepts? How would the graph change if the factor 2 were changed to be a factor -2?

$y = (2x-4)(x+2)(x-3)$

$2x - 4 = 0$

$2x = 4$

$x = 2$

8-5. What is different about $P_3(x) = x^4 - 21x^2 + 20x$? What x-intercept(s) can you determine from the equation, before graphing with the calculator? Explain how you know. Use the graph to figure out exactly what the other intercepts are. Explain how you can prove that your answers are exact.

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CP's: 8 - # 26 ---> 30, 32, 35

8.1.2 How can I predict the graph?

More Graphs of Polynomials

Today you will use what you learned in the Polynomial Function Investigation in Lesson 8.1.1 to respond to some questions. Thinking about how to answer these questions should help you clarify and expand on some of your ideas as well as help you learn how to use the polynomial vocabulary.

8-26. As directed by your teacher, use your finger to trace an approximate graph of polynomial functions in the air. Alternatively, you may sketch each of the polynomial functions below quickly on paper. Just sketch the graph without the x- and y-axes.

3rd a. $P(x)=(x+10)(x+7)(x-12)$

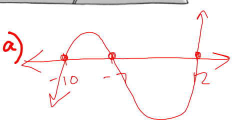
4th b. $Q(x)=(x+6)(x+3)(x-5)(x-8)$

4th c. $R(x)=-(x+4)(x+2)(x-6)(x-10)$

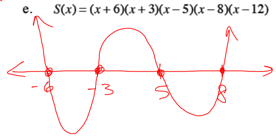
4th d. $W(x)=(x+7)^2(x-7)^2$

5th e. $S(x)=(x+6)(x+3)(x-5)(x-8)(x-12)$

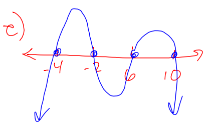
a)



b)



c)



8-27. Look back at the work you did in Lesson 8.1.1 problem 8-2, Polynomial Function Investigation. Then answer the following questions.

a. What is the maximum number of roots a polynomial of degree 3 can have? Sketch an example.

b. What do you think is the maximum number of roots a polynomial of degree n can have?

c. Can a polynomial of degree n have fewer than n roots? Under what conditions?

8-28. For each polynomial function shown below, state the minimum degree its equation could have.

a. Which of the graphs above show that as the x-values get very large, the y-values continue to get larger and larger?

b. How would you describe the other graphs for very large x-values?

c. When the y-values of a graph get very large as the x-values get large, the graph has **positive orientation**. When the y-values of a graph get very small as the x-values get large, the graph has **negative orientation**. How is each of the above graphs oriented?

8-29. For each graph in problem 8-28, you decided what the minimum degree of its equation could be. Under what circumstances could graphs that look the same as these have polynomial equations of a *higher* degree?

Consider the graphs of $y=(x-1)^2$ and $y=(x-1)^4$.

a. How are these graphs similar? How are they different?

b. Could the equation for graph (*ii*) from the previous problem be degree 4?

c. Could it have degree 5? Explain.

d. How is the graph of $y=x^3$ similar to or different from the graph of $y=x^5$?

e. How do the shapes of graphs of $y=(x-2)^3$ and $y=(x+1)^5$ with repeated factors differ from the shapes of graphs of equations that have three or five factors that are different from one another?

8-30. In the first example from the Polynomial Function Investigation, $P_1(x) = (x-2)(x+5)^2$, $(x+5)^2$ is a factor. This squared factor produces what is called a **double root** of the function.

a. What effect does this have on the graph?

b. Check your equations for a **triple root**. What effect does a triple root have on the graph?

8-32. What can you say about the graphs of polynomial functions with an even degree compared to the graphs of polynomial functions with an odd degree? Use graphs from the Polynomial Functions Investigation (and maybe some others) to justify your response.

8-35. Without using a calculator, sketch rough graphs of the following functions.

a. $P(x) = -x(x+1)(x-3)$

b. $P(x) = (x-1)^2(x+2)(x-4)$

c. $P(x) = (x+2)^3(x-4)$

HW: 8 -

36 ---> 44